Cardiac surgery and acute kidney injury: retrospective study

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Acute Kidney Injury (AKI) in the setting of cardiac surgery

INTRODUCTION:

✓ Severe postoperative complication
✓ Increase rate of mortality, morbidity and length of stay in intensive care unit (ICU)
✓ Occurrence: 5% to 42 %

AIM OF THE STUDY:

... Occurrence by type of cardiac surgery?

... Length of stay in ICU and in Hospital?

... Mortality?
MATERIAL AND METHODS:

Retrospective study: 1 year adult surgery

Inclusion criteria

- Off-pump coronary artery bypass surgery (Off-PUMP CABG)
- On-pump coronary artery bypass surgery (On-PUMP CABG)
- Aortic valve replacement (AVR)
- Aortic valve replacement combined with CABG (AVR+CABG)
- Mitral valve repair or replacement (MVR)
MATERIAL AND METHODS:

Retrospective study: 1 year adult surgery

Exclusion criteria

- Mitral valve + CABG
- Aorta surgery
- Redo procedure
- Other combined surgery (eg: + TEA carotid)
- Double valve surgery
- Heart transplant
- Preoperative renal replacement therapy (RRT)
## RIFLE classification

<table>
<thead>
<tr>
<th>Category</th>
<th>Blood criteria</th>
<th>Urine criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk</td>
<td>× 1.5 serum creatinin or GFR ↓ 25%</td>
<td>&lt; 0.5 mL/kg × 6h00</td>
</tr>
<tr>
<td>Injury</td>
<td>× 2 serum creatinin or GFR ↓ 50%</td>
<td>&lt; 0.5 mL/kg × 12h00</td>
</tr>
<tr>
<td>Failure</td>
<td>× 3 serum creatinin or GFR ↓ 75%</td>
<td>&lt; 0.3 mL/kg × 24h00</td>
</tr>
<tr>
<td></td>
<td>OR ≥ 4 mg/dL with ↑0.5mg/dL</td>
<td>OR anuria × 12h00</td>
</tr>
<tr>
<td>Loss</td>
<td>Complete loss of kidney function &gt; 4 weeks</td>
<td></td>
</tr>
<tr>
<td>End-stage kidney disease</td>
<td>ESKD &gt; 3 months</td>
<td></td>
</tr>
</tbody>
</table>

GFR= Glomerular Filtration Rate

RESULTS:

N= 598 cases (100.0%)

Excluded cases
n= 164 (27.4%)

Included cases
n= 434 (72.6%)
Type of surgery  n= 434 (100%)

- On-PUMP CABG: 182 (42%)
- AVR: 104 (24%)
- AVR+CABG: 46 (11%)
- MVR: 44 (10%)
- Off-PUMP CABG: 58 (13%)

M-G LAGNY ECCP ULg CHU
Postoperative renal status

n = 434 (100%)

NO AKI
n = 221
51%

AKI
n = 213
49%
Postoperative renal status

- AKI: 213 (49%)
- Injury: 108 (51%)
- Risk: 79 (37%)

Total: 213 (100%)
Postoperative renal status

- AKI
  - 213 (49%)

- Injury
  - 108 (51%)

- Risk
  - 79 (37%)

- Failure
  - n=26 (12%)
  - RRT = 8 (4%)

n=213 (100%)
Postoperative AKI: Failure

$p<0.0001$
### Risk of AKI

#### Off-PUMP CABG vs On-PUMP CABG

<table>
<thead>
<tr>
<th></th>
<th>Off-PUMP CABG n=58</th>
<th>On-PUMP CABG n=182</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKI, n (%)</td>
<td>21 (36.0)</td>
<td>80 (44.0)</td>
<td>0.29</td>
</tr>
<tr>
<td>Failure, n (%)</td>
<td>2 (3.00)</td>
<td>10 (5.00)</td>
<td>0.70</td>
</tr>
<tr>
<td>EuroSCORE 1 Log</td>
<td>2.72 (1.5 - 5.1)</td>
<td>3.05 (1.9 - 6.7)</td>
<td>0.083</td>
</tr>
<tr>
<td>MI preop (&lt;3 months), n (%)</td>
<td>4 (6.90)</td>
<td>39 (21.4)</td>
<td>0.032</td>
</tr>
<tr>
<td>CABG (&gt;2 vs ≤ 2), n (%)</td>
<td>21 (36.2)</td>
<td>134 (73.6)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>ICU stay (days)</td>
<td>2.0 (2 - 3)</td>
<td>2.0 (2 – 4)</td>
<td>0.012</td>
</tr>
<tr>
<td>Hospital stay (days)</td>
<td>11.5 (10 – 15)</td>
<td>12.0 (10 – 18)</td>
<td>0.14</td>
</tr>
<tr>
<td>Hospital mortality, n (%)</td>
<td>0 (0.00)</td>
<td>4 (2.20)</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Data are expressed as M (IQR)
## Risk of AKI

### CPB procedures

### Preoperative data

<table>
<thead>
<tr>
<th></th>
<th>Non AKI n=184</th>
<th>AKI n=192</th>
<th>p value</th>
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<tbody>
<tr>
<td>Age (years)</td>
<td>66.0 (59 - 74)</td>
<td>72.0 (63 - 77)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>BMI (UI)</td>
<td>25.7 (23 - 28)</td>
<td>26.9 (24 - 30)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>GFR (mL/min)</td>
<td>82.0 (72 - 96)</td>
<td>70.5 (55 - 88)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Parsonnet Log</td>
<td>5.76 (3 - 12)</td>
<td>8.41 (4 - 17)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>EuroSCORE I Log</td>
<td>3.60 (2 - 6)</td>
<td>4.98 (2 - 9)</td>
<td>0.008</td>
</tr>
<tr>
<td>CIN score</td>
<td>4.27 (2 - 8)</td>
<td>6.44 (4 - 9)</td>
<td>0.002</td>
</tr>
<tr>
<td>ARF score</td>
<td>1.00 (0 - 2)</td>
<td>2.00 (1 - 3)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Data are expressed as M (IQR).
CIN score: Contrast Induced Nephropathy (Mehran and all, JACC Vol.44 No.7, 2004 October 6,2004:1393-9).
## Risk of AKI

### CPB procedures

#### Peroperative data

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<tbody>
<tr>
<td>CPB time (min)</td>
<td>85.0 (70 - 100)</td>
<td>89.0 (75 - 106)</td>
<td>0.048</td>
</tr>
<tr>
<td>Clamping time (min)</td>
<td>52.0 (39 - 64)</td>
<td>58.0 (43 - 74)</td>
<td>0.009</td>
</tr>
<tr>
<td>Nadir Hct ≤ 21%, n (%)</td>
<td>102 (55.4)</td>
<td>127 (66.5)</td>
<td>0.028</td>
</tr>
<tr>
<td>RBC transfusion, n (%)</td>
<td>30 (16.3)</td>
<td>50 (26.5)</td>
<td>0.017</td>
</tr>
<tr>
<td>UF, n (%)</td>
<td>21 (20.6)</td>
<td>11 (13.8)</td>
<td>0.22</td>
</tr>
<tr>
<td>UF, mL</td>
<td>1000 (1000-1600)</td>
<td>1300 (1000-2000)</td>
<td>0.013</td>
</tr>
</tbody>
</table>

Data are expressed as M (IQR)
### POSTOPERATIVE DATA

**CPB procedures**

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<th>AKI n=192</th>
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<tr>
<td><strong>ICU stay (days)</strong></td>
<td>2.0 (2 - 3)</td>
<td>3.0 (2 - 4)</td>
<td>0.003</td>
</tr>
<tr>
<td><strong>Hospital stay (days)</strong></td>
<td>12.0 (10 - 16)</td>
<td>13.0 (10 - 19)</td>
<td>0.49</td>
</tr>
<tr>
<td><strong>Hospital mortality, n (%)</strong></td>
<td>5 (2.72)</td>
<td>8 (4.17)</td>
<td>0.44</td>
</tr>
</tbody>
</table>

Data are expressed as M (IQR)
Probability of length of stay in ICU

Probability of length of stay (Klaplan-Meier) in intensive care unit by grade of gravity AKI.

Days
Probability of length of stay.

RISK
INJURY
FAILURE

$p < 0.0001$
CONCLUSIONS

- Limits
- RIFLE classification
- Large proportion of AKI
- Length of stay
- Great mortality with AKI FAILURE (RRT)
- High risk patients
- Prospective study
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